

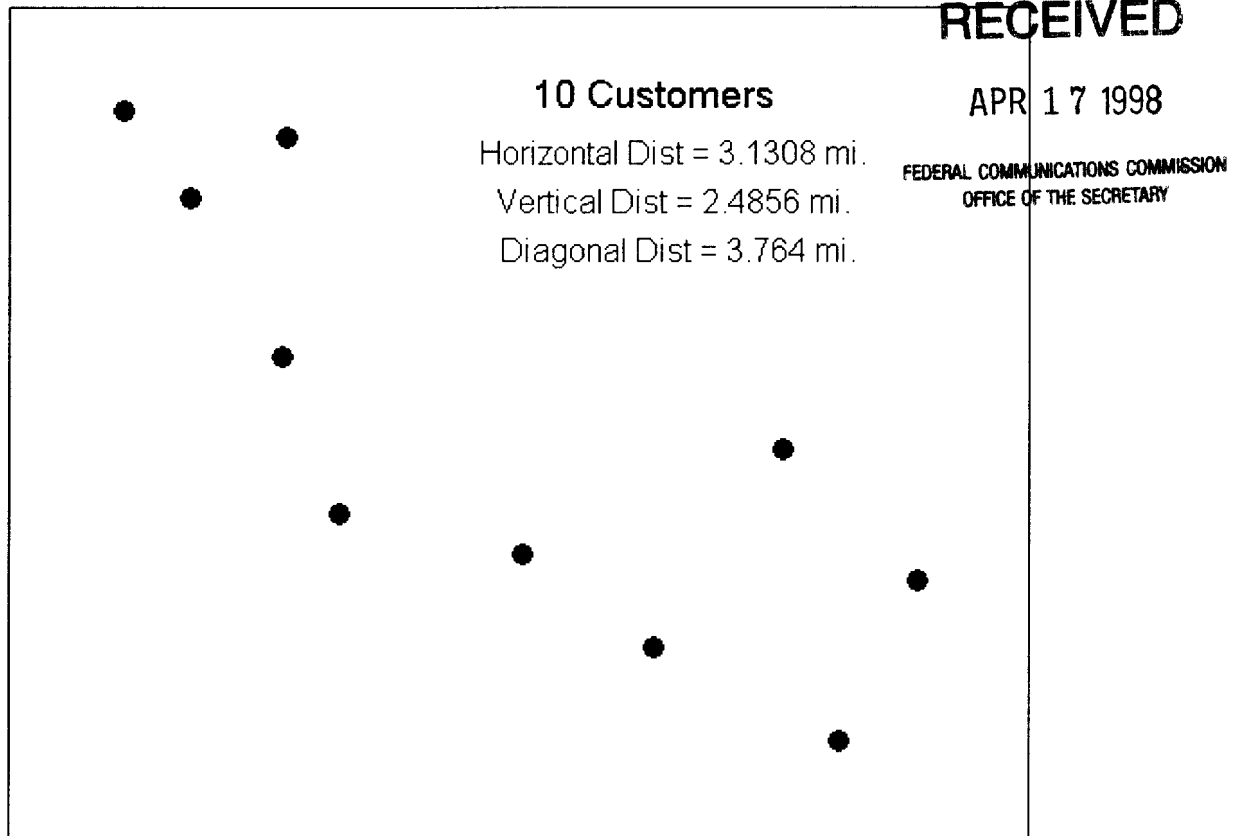


**Law & External Affairs**  
1850 M Street, NW, Suite 1100  
Washington, DC 20036  
Voice 202 828 7452  
Fax 202 296 3469  
pete.n.swenki@mail.sprint.com

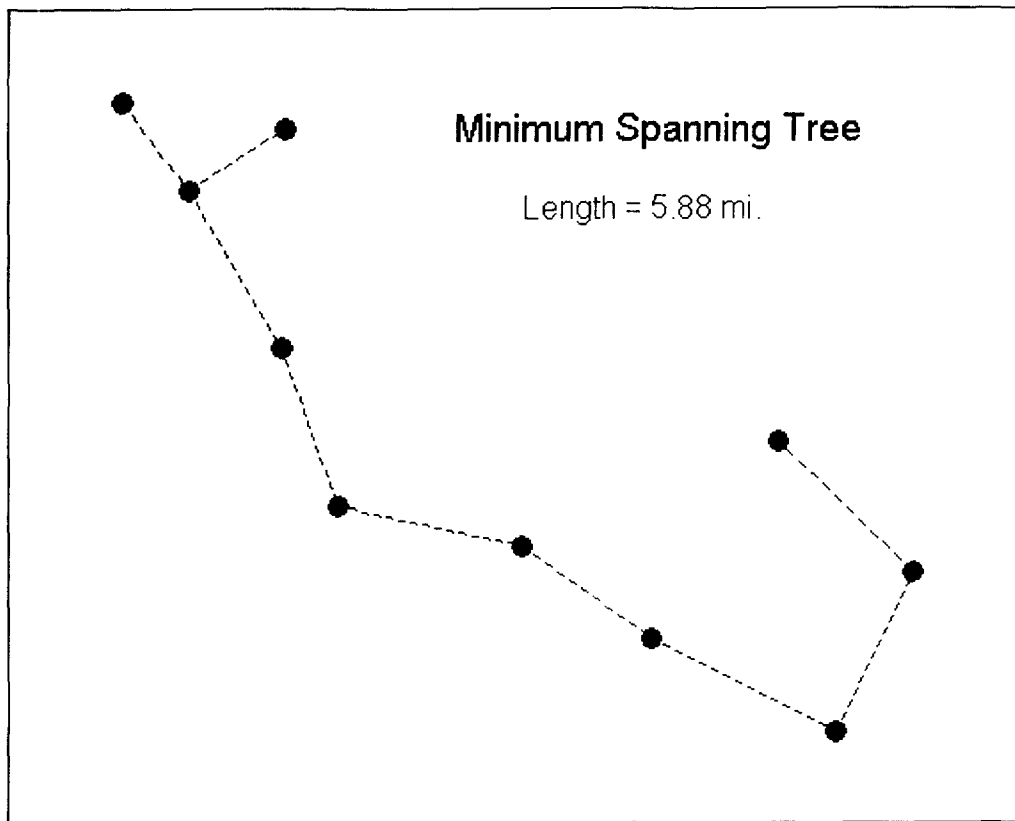
No. of Copies rec'd 043  
List ABCDE

## Hatfield's Polygons Converted to Rectangles

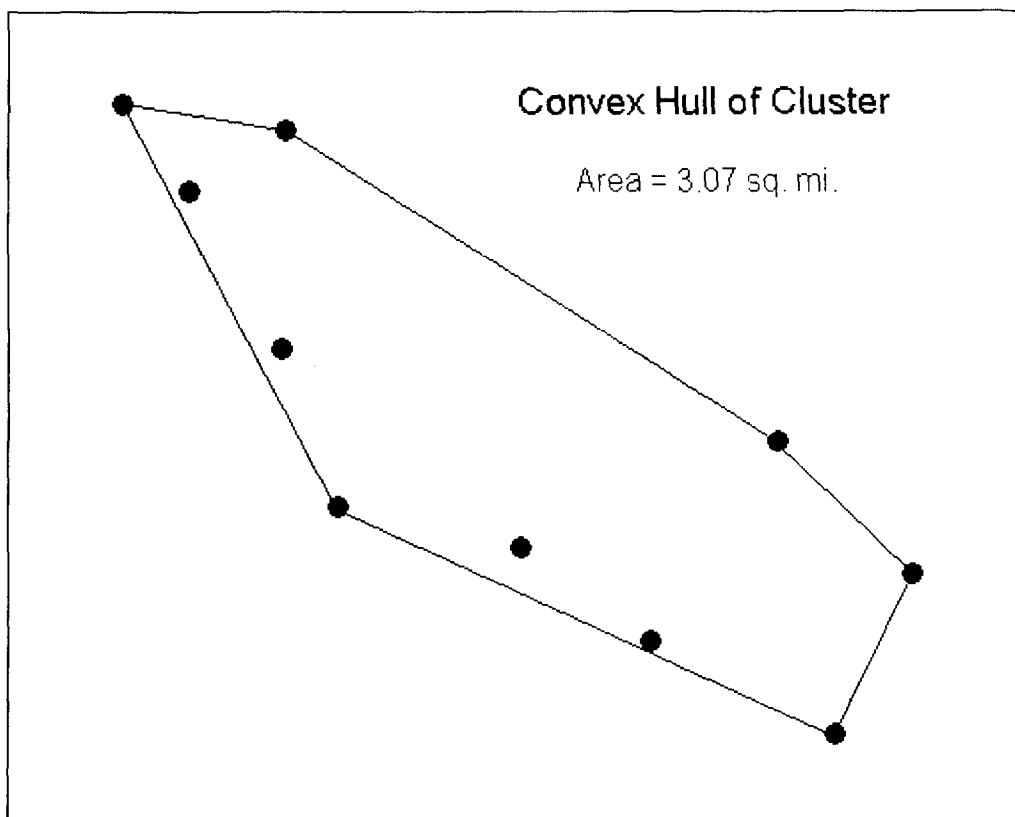
The Hatfield 5.0a Model groups a set of “actual” customer points into a *cluster*, according to a set of aggregation rules.



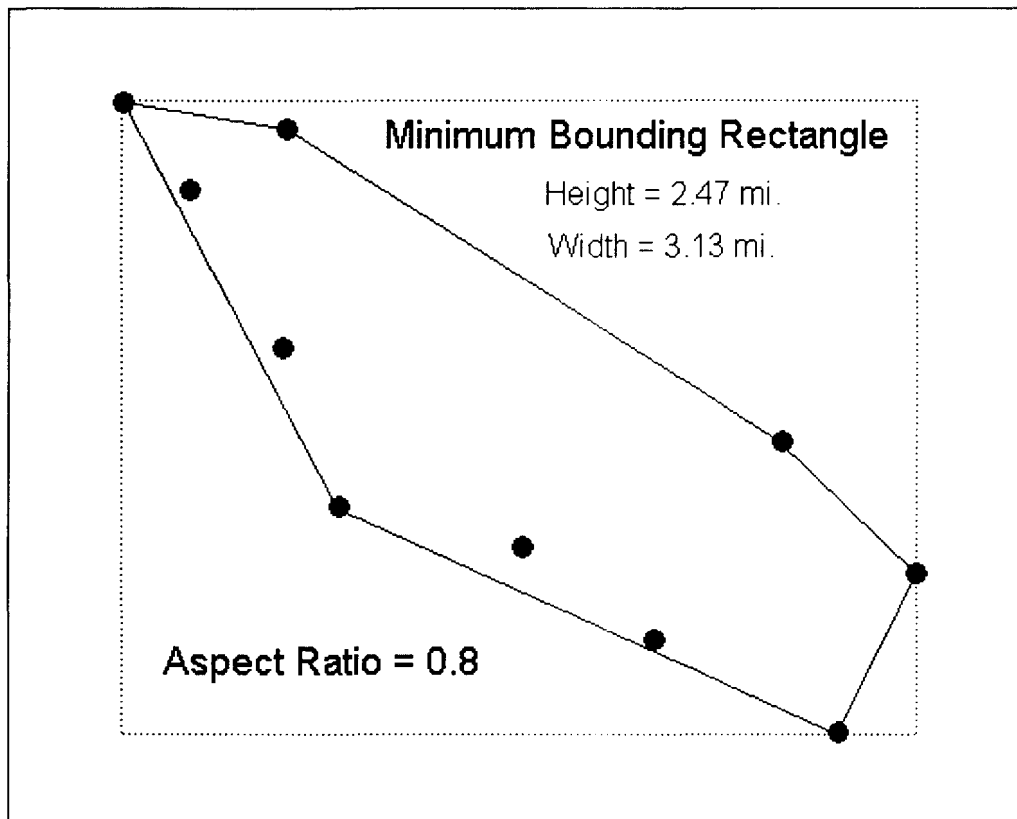
We have determined that the *minimum spanning tree* for these points – the mathematically shortest connection possible for these points – is 5.88 miles.



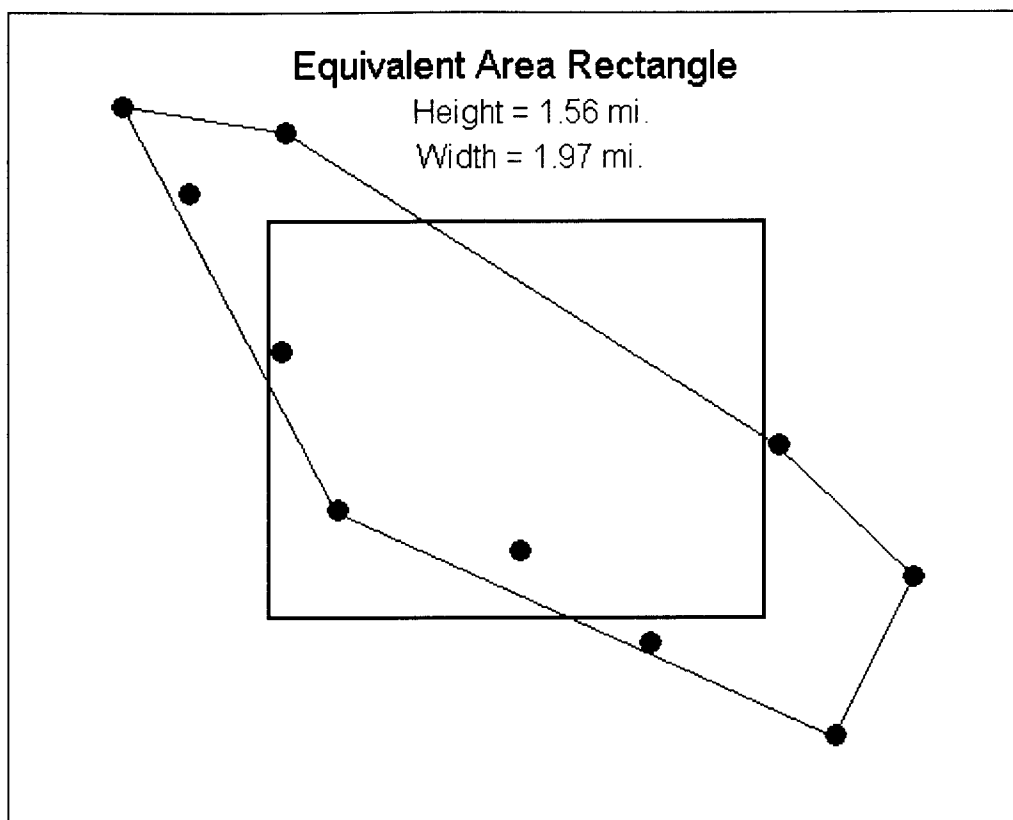
When Hatfield has determined the set of points that constitute a cluster, it logically draws a *convex hull* around those points, and determines its area.



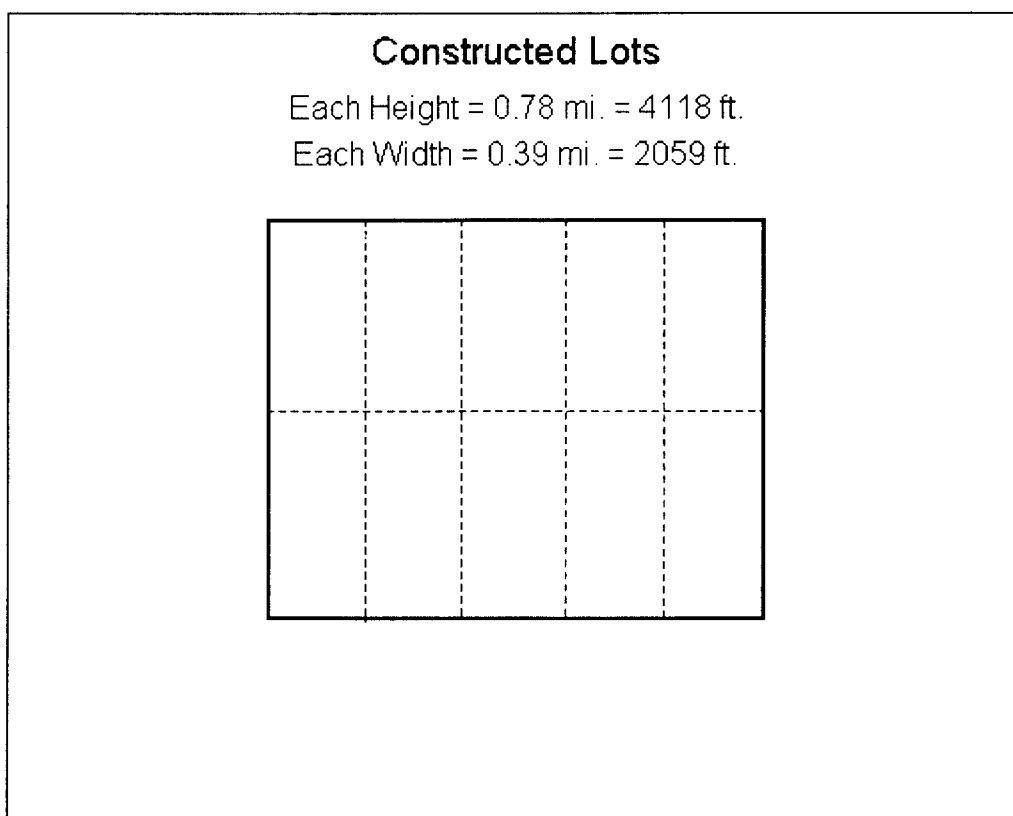
Hatfield then logically constructs a *minimum bounding rectangle* – oriented north-south-east-west – that exactly bounds the cluster's points. Hatfield then determines the *aspect ratio* of that rectangle (that is, the ratio of the rectangle's height to its width) ... in this case, 0.8.



Hatfield then constructs a *rectangle* with the above aspect ratio; the *size* of that rectangle is determined, of course, by its *area* ... and that area is set to be the *area of the convex hull* ... in this case, 3.07 square miles.



Hatfield then constructs *lots* within this constructed rectangle. Each lot is twice as high as it is wide.

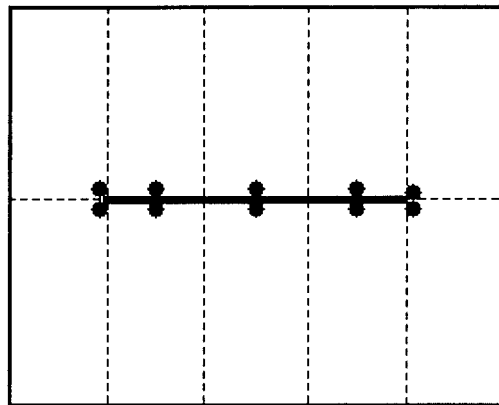


A *branch cable* is then constructed, and 150 ft. drops connect to the customers.

### Cabling to Serve Customers

Branch Cable Length = 6177 ft.

10 Drops, each at 150 ft.



Total Cable Length = 7677 ft. = 1.45 mi.

**Less than 1/4 of the Minimum Spanning Tree length!**

But note how closely the customers are squeezed toward the branch cable. The arrangement is unrealistic, both from the standpoint of cable length *and* from the standpoint of area served.

### Customer Area Served

Height = 300 ft.

Width =  $106 + 6177 + 106$  ft. = 6389 ft.



Area Served = 1,916,700 sq. ft. = 0.0688 sq. mi.

But Actual Cluster Area = 3.07 sq. mi.

Area Modeled is 1/44 of Cluster Area

So, HOW BAD CAN THIS BE?

To what extent does the combined effect of:

- 1) converting the polygon into a rectangle (with identical area) and
- 2) building cable only to the point where the perimeter lots start
- 3) assuming all customers have drops 150 feet or less

cause the model to UNDERSTATE the amount of cable needed to transverse the ACTUAL distances between customers?

The following table shows a sample of several individual clusters (not wire centers) in Nevada (Nevada Bell territory).

The table gives an example of the amount of cable needed to reach all actual customer locations in the cluster. The locations do NOT include any outlier locations. The distance reported is only the distance between points that reside in the main clusters.

This length represents an approximation of the amount of distribution that the Hatfield Model (or any proxy model) should build in the course of laying out the network and determining the associated cost.

The table also shows the amount of actual distribution the Hatfield Model builds to each respective cluster (again, excluding outlier points).

Cluster Number	Absolute Minimum Distance Between Cluster Points (in feet)	Total Amount of Distribution Cable Built by Hatfield Model (in feet)
CHBTNV11.C003	23,500	7,900
IMLYNV12.C022	29,000	2,210
UPMDNVXF.C005	29,000	836
IMLYNV12.C015	38,000	2,089
DYTNNV11.C004	21,000	1,494
EMPRNV11.C004	21,500	5,093
EMPRNV11.C003	24,500	0

## WHAT DOES THIS EVIDENCE EXPLAIN?

**CONCLUSION #1:** The Hatfield Sponsors' claim the placing surrogate points on the perimeters of CBs is a conservative approach (causing the model to overstate customer dispersion and therefore overstate required feet of plant) is completely false.

**FACT:** When points are placed in an (approximately) straight line, the area of the resulting polygon is miniscule and the converted rectangle with identical area distorts (understates) actual customer dispersion immensely.

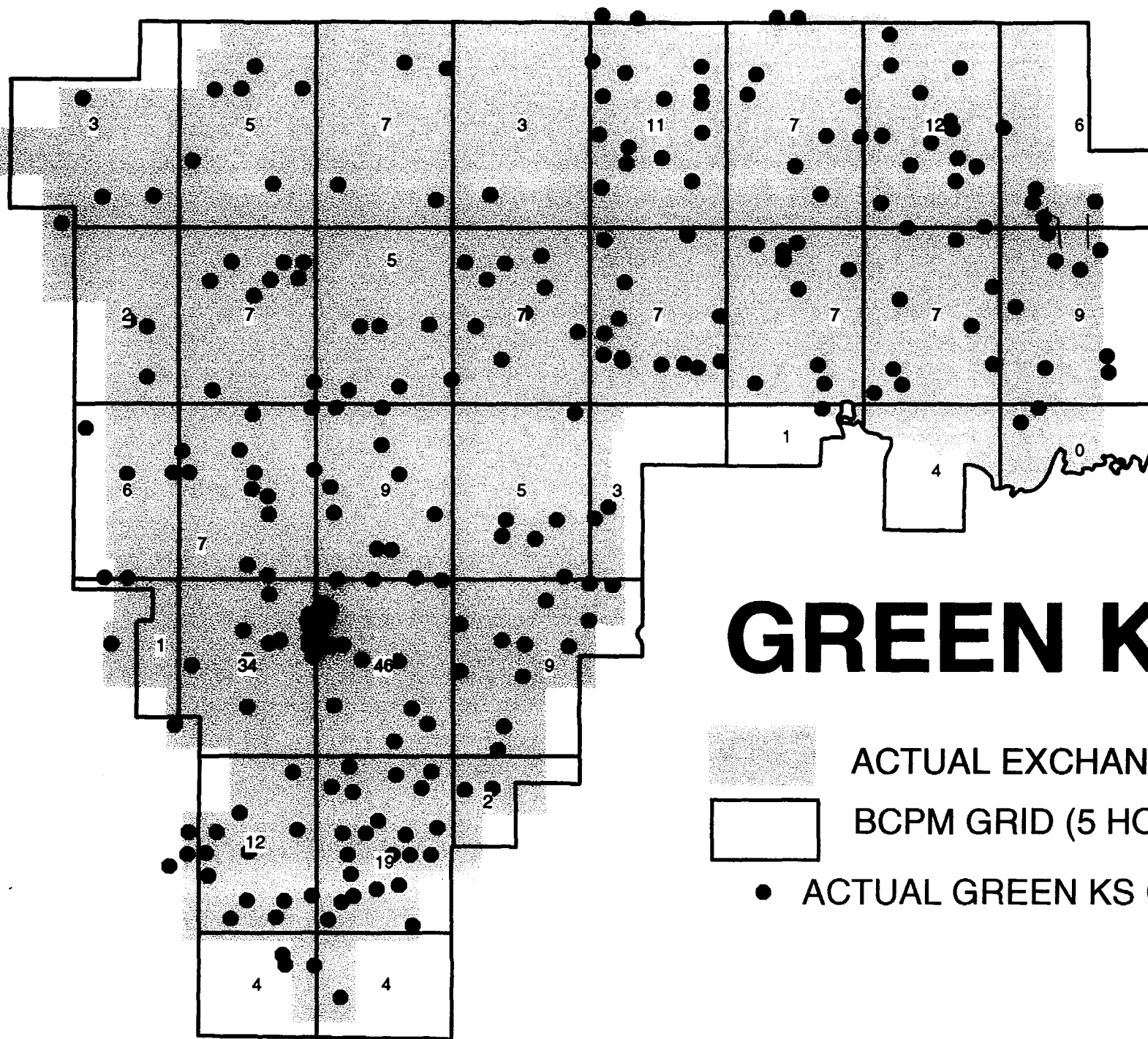
**CONCLUSION #2:** This phenomenon has nothing to do with geocoding.

**FACT:** The understatement of plant does not depend on points being actual or surrogate. If a cluster is made up of 100% actual geocoded points and those points happen to be stretched out in a semi-linear fashion (i.e. along a road where geocoding places points), the same distortion will take place.




**CONCLUSION #3:** This also explains the significant differences in route mileage produced by the BCPM and the Hatfield Model for the same wire centers.

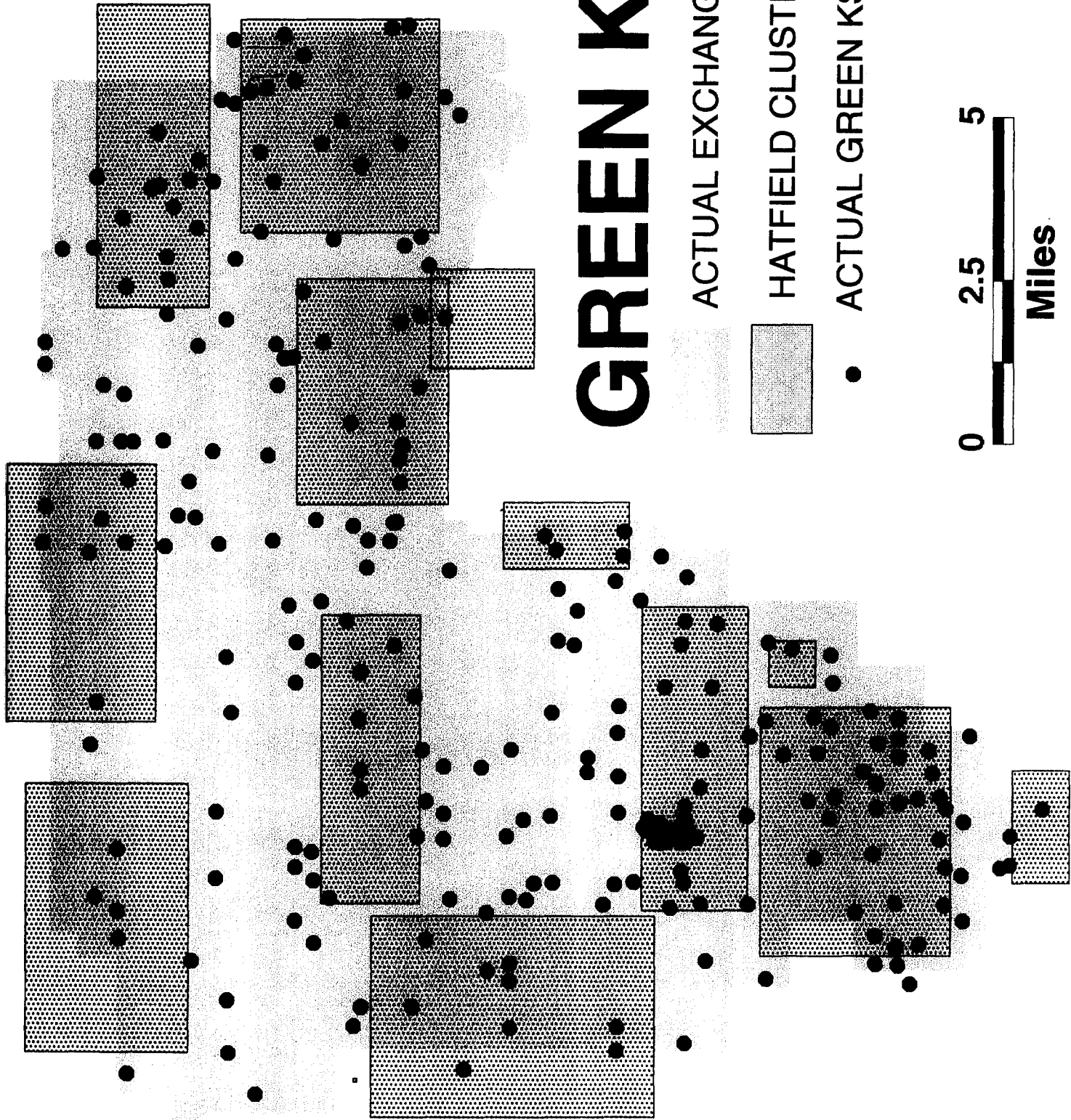
**FACT:** In many cases the BCPM estimates 10 times more distribution cable for a given wire center than the Hatfield Model does. Looking at only four clusters in the Imlay, NV wire center, we produce the same table:

Wire Center	Absolute Minimum Distance Between Cluster Points (in feet)	Total Amount of Distribution Cable Built by Hatfield Model (in feet)
4 Clusters in Imlay, NV (aggregated)	140,000	17,000



# GREEN KS

-  ACTUAL EXCHANGE BOUNDARY
-  BCPM GRID (5 HOUSEHOLDS)
-  ACTUAL GREEN KS CUSTOMERS



# GREEN KS

ACTUAL EXCHANGE BOUNDARY



HATFIELD CLUSTER

• ACTUAL GREEN KS CUSTOMERS

0 2.5 5



Miles